

## **SATS TECHNICAL AND PARTNERING WORKSHOP**

### **DAY 1, A.M. - January 23, 2001**

Paul Masson of STARNet, meeting facilitator opened the meeting promptly at 9:00 a.m. by welcoming attendees and laying out the workshop objectives. This is the first time that NASA has held a SATS meeting to talk about the program specifically as it relates to a 5-year program. The goal of this two-day workshop is to generate ideas and obtain feedback from the SATS business community as to what should be included as part of the 5 year program and start a dialogue on possible technology sets that demonstrate the 4 operational capabilities.

It was requested that those who have not read the SATS White Paper to get a copy from the registration table and/or visit the SATS website (<http://sats.nasa.gov>).

Mike Durham presented an overview of the SATS program to date including the long-term vision.

Peter Padilla gave a presentation of SATS Capabilities and Goals related to Higher Volume Operations at Non-Towered/Non-Radar Airports; High Density Operations.

Ken Goodrich gave an overview presentation on Virtual Visual Meteorological Conditions (VVMC). Operations by single-pilot as a lone aircraft in the SATS environment. He presented a review of the goals and capabilities including low visibility approaches at minimally equipped landing facilities; improving single-pilot performance in complex, evolving NAS (ATP like performance); Cost effectiveness.

Steve Hampton of Embry-Riddle Aeronautical University gave an overview presentation of the Southeast SATS Lab Consortium. Players in the SE SATS lab are Embry-Riddle Aeronautical University, the State of Florida, Florida Industry, and the NASA Langley Research Center. Serve as the Southeastern States focal point for "Proof of Concept Demonstrations".

Dr. George L. Donohue of the George Mason University and the VA SATS Lab Consortia gave an overview presentation of the Virginia SATS Lab Research and Operational Evaluation.

### **General Questions and Answers:**

Paul Masson, Facilitator: Asked Mike Durham to outline the differences between General Aviation Program and whether it's synonymous with the SATS program and SATS partnership.

Mike Durham: SATS is a new NASA general aviation investment, not NASA's only GA investment. We are structured within base research long-term programs such as Airspace Vehicle Systems Technologies, Propulsion, Airspace operations – all application-type operations. Not aircraft class specific. There is not one program formulated around GA. There are specific focus programs which are application oriented generally planned around a 5-year timeline. In general these activities are near-term focus. Nothing NASA does is really near-term. If it's not high risk then NASA

is not interested. SATS is a new initiative planned as a focus program. We are book-kept under a base program called the Aerospace Vehicles Technology Program. In addition to basic investments, GA propulsion at Glenn, AGATE Consortium activity, and some GA investments within other focus programs such as aviation safety. The Aviation Safety Program is a 10 year effort created from reprogrammed aeronautics funding that is focused on technology to improve safety both in the commercial and general aviation sectors. These programs are managed separate from SATS, but all are coordinated and leveraged, SATS is not working in a vacuum.

Comment: The FAA certification line is very critical. AGATE took certification to heart and followed a proper process and jump-started the cert. Effort. Need to see this done with SATS in a lessons learned approach. Certification should be with a big "C". Operational and integration with the ATC system.

Question: Would that translate into also having the alliance create certification teams?

Answer: Yes

FAA comment: A key element of any SATS proof will be consideration of how SATS operations will be integrated into the future NAS. The FAA is committed to work with the program to insure success.

Comment: A major consideration for FAA acceptance of SATS proofs is demonstration and evaluation of how SATS operations exist in a "mixed" equipage environment. While one scenario might suggest that all aircraft could be equipped to announce their location that likelihood is constrained by the fact that there are today more than 180,000 aircraft in the general aviation fleet. The assumption that all aircraft must be equipped may deny some new or emerging technology solution which would permit certain knowledge of the accurate location of all aircraft in the system regardless of equipage. It is important to consider as wide a set of options as possible and not to unnecessarily constrain our research, yet, the proof set must include recognition of the needs of the large population of possibly unequipped aircraft represented by today's GA fleet.

Comment: In reference to the NAS investment, there are significant NASA investments in terms of NAS research completely outside SATS and much more near-term in focus. SATS should be a fresh, "revolutionary" approach on operations within the NAS. SATS should be the thing to gamble in, further out of the box. The individual roles of NASA and FAA are unique and different and supported by independent congressional appropriations which discourage overlap or duplication of activities. It is appropriate for NASA to have a stretch goal approach and for FAA to have a more real time, operational approach aimed at the current hub and spoke system. All participants should focus on how their organization is aligned and can contribute.

Question: NASA has selected 6 enabling technologies. What needs to happen with these six? The selection of these technologies need to be communicated.

Answer: The 6 technologies in the White Paper are not a down-selected set of technologies. These are examples that *could* be a key enabler for the operating capabilities. NASA in concert with industry will make definitive determinations about what should be in the plan. NASA is interested in all the emerging technologies. NASA is seeking direct feedback on what technologies we need to include to develop a better plan.

Additional Comment. The 6 technologies highlighted represent research areas where NASA has already made significant investments.

### **SATS TECHNICAL AND PARTNERING WORKSHOP DAY 2, P.M. - January 24, 2001**

Paul Masson, meeting facilitator, divided the workshop participants into 4 discussion groups. The groups were tasked with discussing three of the four operating capabilities (Higher Volume Operations at Non-Towered/Non-Radar Airports, Flight Systems for Improved Total System Performance, Lower Landing Minimums at Minimally Equipped Landing Facilities) in terms of each capability's objectives, technical challenges and other issues in the context of a 5 year SATS program. The groups were directed to capture the discussion points and present their findings the following morning of the workshop.

### **SATS TECHNICAL AND PARTNERING WORKSHOP DAY 2 A.M. - January 24, 2001**

Paul Masson, meeting facilitator of STARNet opened the meeting promptly at 8:30 a.m. He invited each of the working groups to present their findings.

The following working group leads presented their conclusions following yesterday's discussion of the three operating capabilities:

- Higher Volume Operations at Non-Towered/Non-Radar Airports
- Flight Systems for Improved Total System Performance
- Lower Landing Minimums at Minimally Equipped Landing Facilities

- **Franklin Porvath, Group 2 Lead**

#### **Questions/Comments:**

Did the group discuss how much is believed can be accomplished in the next 5 years? He felt the priority listed items could be accomplished.

Slower aircraft? – that seems counter to the philosophy to higher density operations.

Aircraft should be able to approach from different directions the first time but not slower. The aircraft may need envelope protection and other methods of preventing stalls. If its fly by wire the pilot should be able to slow down. If you want to compare it to the current highway system the ability to fly slow is important for less trained pilot.

Slower means fewer throughputs but if you allow constant interval between aircraft then you should get the same through put.

Concerned about less trained pilot in weather. May need to see go no go situations.

- **Michael Knasel - Group 3 Lead**

**Questions: None**

- **Bob Peake – Group 1 Lead**

**Questions/Comments:**

Would Auto-land be as emergency or routine operation? Did not limit.

AGATE had a meeting at CAMI about envelope protection that it really wanted to avoid – not allowing the pilot to exceed was unacceptable. It keeps coming up.

It's healthy that this is revisited after 5 years. Good arguments on both sides.

Boeing used a philosophy we may want to consider. They make it difficult but not impossible for pilot to exceed the envelope protection. Need to seriously consider that original limitation was developed for highly-experience operators.

The concept of envelope protection was sound at the time. Need to consider hard or soft limits. Want to strongly develop a system notion that people can manipulate.

Relative to engine liability can you elaborate? Started with power plant and then extend to other parts of the propulsion system. Need to not lose the velocity capability. What is it about today's engines that we need to change? Part of the reason virtual VMS in IFR conditions we have a lower trained group of pilots, single engine airplane, the propulsion may not be that reliable. When you go to virtual VFR it is much more critical a real VFR and the engine becomes more critical.

- **Dave Grieco- Group 4 Lead**

**Questions/Comments: None**

**Fourth Operating Capability Discussion:** Dave Hahne requested comments relative to the fourth operating capability, Enroute and Integration into the NAS, to be emailed to d.e.hahne @larc.nasa.gov by close of business, Friday, January 26, 2001.

SATS Points of Contact for feedback and comments will be put on the NASA web site.

**SATS Proof of Concept Evaluation/Demonstrations:**

Jim Burley presented NASA's view of Proof of Concept Evaluation/Demonstration. Included SATS Showcase Demonstrations goals, objectives and stakeholders.

Jim Burley led discussion for the SATS Showcase Demonstrations. Presented some key technologies required. Highlighted the "Airborne Internet" as a critical technology development area. This is a high bandwidth communications system that enables aircraft-to-aircraft and aircraft-to-ground collaborations that minimizes or eliminates conventional ATC communications. High bandwidth is key.

Jim Burkey asked Mike Zernic to comment. Airborne Internet element is comprised of two things, the physical layer (satellites) and the network layer which includes management systems to help operator determine correct physical layer to use.

Discussion Points:

- Flight Evaluations: 05 systems architecture is different than end-state,

- What level of participation by stakeholders in flight evaluations do we need?

- What is the scope of flight demonstrations relative to mission complexity and fidelity, number and type of aircraft, robustness, etc.?

Comment: Want to emphasize that the overall purpose of the SATS program is to show it works and you have five years to do so. The program must convince the decision makers that a national investment decision is warranted by demonstrating the technical , socio-economic and business deployment viability of the four SATS operating capabilities. Through an alliance structure, the SATS stakeholders can collaboratively develop the technologies, conduct flight experiments, integrate, demonstrate and evaluate the SATS Concept.

**SATS Systems Analysis:**

Stuart Cooke outlined the SATS systems analysis process and provided a status of the SATS Precursor Studies.

Systems-Level Benefit Analyses Discussion Points:

- What metrics best capture the SATS concept also allowing comparisons with other modes of transportation?

- How do we begin to capture future market potential?

- How can we overcome perceived barriers?
- Intermodal-portal time.
- You need automotive market research.
- Are the pilot community themselves willing to accept lower flight abilities?

General observation: We are engaged in technology push and what will drive it is the economic pull, public benefits, that will push the providers to make it affordable. The competition for dollars and interest will be the motivating factor.

NASA seeks feedback and comments on the above discussion points

## SATS TECHNICAL AND PARTNERING WORKSHOP DAY 2, P.M. - January 24, 2001

### NOTES:

Paul Masson, meeting facilitator, opened the afternoon session.

Gaudy Bezos-O'Connor: Gave an overview summary presentation of SATS Partnering status and objectives.

Keith Gail led the research effort for STARNet on federal research and technology partnering models. Keith gave an overview of partnership analysis which compared two alternative models, Sematech (semiconductor industry alliance) and Amtex (U.S. textile industry alliance).

### **Sematech and Amtex Alliance Model Questions/Comments:**

Question: What were the key things the third party intermediary of AmTex did?

Answer: He hosted meetings, held a vote, responsibility for membership rights of the 65+ companies, distribution of funds, monitoring technology reporting.

Question: What were the lower-level intermediaries?

Answer: Research institutes did the technology development.

Question: How did they work together? As a board? Who ran the third party intermediary?

Answer: Each of the four research institutes were housed at a university. That University professor had a role in the overall planning. They would have a bottom up plan to present to AmTex and it would give to a board who would review.

Question: Did money flow from DOE to AmTex and then down to the individual research institutes?

Answer: The government was able to fund one part through the coordinating entity and other parts individually. This made flexibility on both sides.

Question: What was the relationship between AmTex and the lower intermediaries? Did the research institutes compete?

Answer: No. The top level of AmTex had three capabilities. They distributed among the four intermediaries.

Question: Given the organization model, in Keith's opinion, and the four institutes below could they have given money for the four intermediaries to compete.

Answer: They had the flexibility, collaborate or compete. There was a top level coordinating group that determined which would happen.

Question: Describe what's in the public technical box:

Answer: Within DOE there were 14+ different laboratories each had a representative that was a program manager who led up into an oversight board who was within the DOE.

Question: There had to have been a lot of discussion between the public technical box and the research technical teams. Did the top down plan for theoretical technical feasibility plan or something to be commercialized?

Answer: They were designed for commercialization.

Question: Could you be more specific as to who made the governance majority of votes?

Answer: They were equally balanced but the private sector has 65+ entities. The board was consisting of 15 public sector 65+ of private sector. The board was not of 95 people but three champions one from public, one from private, and one from AmTex. To get consensus one industry champion emerged from each area.

### **Single Public-Private Program Interface (SPPPI) Discussion Points and Issues.**

-Recommend a scoped-down SPPPI (financial tracking, intellectual property management, technical support team)

-Recommend formation of an advisory board to include SATS alliance membership and other stakeholder groups

-Who would own the technology? Would the SPPPI and its alliance members who develop technology have access to all the technology developed under the SATS umbrella or just what they create?

-How will NASA researchers be plugged in?

-Many potential alliance members have invested considerable dollars in background IP – how do they protect that investment

-Governance issue: How much control is NASA willing to give up to the SPPPI and in what they give up who will call the shots. There is nothing in this vision where a civil servant will be on the SPPPI board. There will be some type of governance structure outlined

-Is NASA going to be the total alliance manager as in AGATE?

-Who accepts liability for decisions? Example: Intellectual property, patent decisions.

-The use of non-litigation first and non-arbitration for resolution of conflicts.

-How will the funding flow?

-How do the alliance members work together and where would NASA fit?

NASA plans to address the aforementioned issues in the solicitation process.

**Open Issues for the Alliance:**

- Alliance should create certification teams.
- When talking about NASA participation in concert with Industry at the industry sites how do you expect that to work within the travel constraints?
- How will NASA deal with new issues, i.e., new technology?
- Multiple alliances
- Multiple competitors.
- Technology licensing
- Patent enforcement
- Alliance member vs Sub-contractor
- Conflict avoidance – research teams and SPPPI
- Non US participants
- US subsidiaries in foreign companies
- Level of membership – rights by level
- Governance issue – ultimate control
- What counts as contribution, in kind
- Stakeholders roadmap – commercial deployment

**Stakeholders that need to be brought into the Alliance formation discussion:**

- Operators are not present – charter NATA, AOPA
- State – FBO
- Large air framers, electronic firms



- Northrop
- Boeing
- Raytheon
- User groups:
- Airport commissioners
- Airport authorities, managers (AAAE)
- NASAO
- Airline pilots associations
- GA
- NBAA
- Fuel Suppliers
- Package delivery
- State EDA's
- Educational Institutions
- Flight Training
- Private training and publishers companies
- Flight Safety
- Insurance Companies – brokers
- Unions of PTCO –
- Air Traffic Controllers
- NATCA
- Linkage into AMB
- HFI and offshore drilling
- Regional airline associations
- Propulsion companies
- RTCA
- Forest Service
- Special Use – Olympics
- NBTA – National business travelers association
- Fractional ownership suppliers
- GSA
- American Planning Associations
- Urban planners
- Transportation planning
- Civil Air Patrol
- Department of Transportation
- Intermodal
- DOT
- NTSB
- Emergency Services
- AIAA American Institute of Aeronautics and Astronautics
- ROA work
- GASTC General Aviation's Technical
- ICAO
- ERAST
- Kit companies
- Airport surface control
- DOD, GA office